Satellite Industry Perspective for WRC-27

GSOA
GLOBAL SATELLITE OPERATORS ASSOCIATION

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8 May 2025

GSOA Members

The CEO-driven association representing the entire satellite industry

GSOA provides a platform for collaboration between member companies involved in the satellite ecosystem globally and a unified voice for the sector

Overview of Satellite Communications

1 Critical Services

Satellites support weather forecasting, remote sensing, defense and security, and positioning/navigation/timing (PNT) services.

2 Global Connectivity

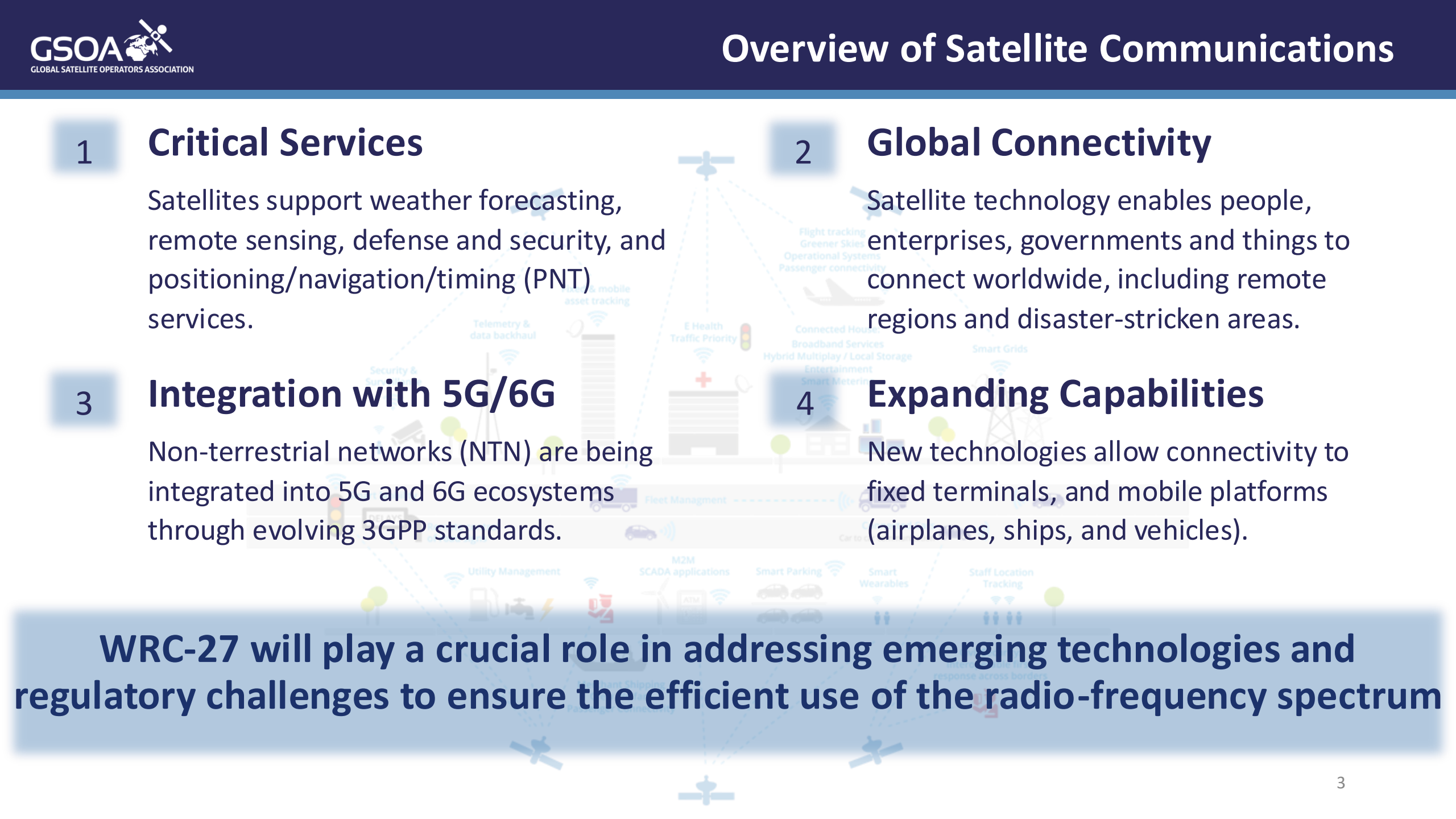
Satellite technology enables people, enterprises, governments and things to connect worldwide, including remote regions and disaster-stricken areas.

3 Integration with 5G/6G

Non-terrestrial networks (NTN) are being integrated into 5G and 6G ecosystems through evolving 3GPP standards.

4 Expanding Capabilities

New technologies allow connectivity to fixed terminals, and mobile platforms (airplanes, ships, and vehicles).



WRC-27 will play a crucial role in addressing emerging technologies and regulatory challenges to ensure the efficient use of the radio-frequency spectrum

Advances in Satellite Technology

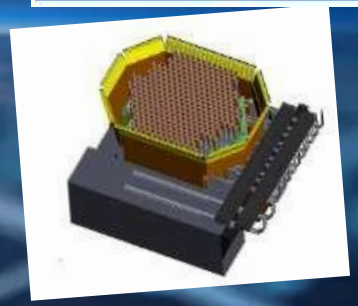
Multi-Orbit Satellites
Inter Satellite Links
Software Defined Satellites

Increased Payload Flexibility:
- Adv. Digital beam forming processors
- Advanced phased arrays
- Ka MPA - lower cost of capacity

Reduced infrastructure costs:
- More efficient payloads
- Advanced Electric Propulsion
- Lower dry mass - lattice like structures

Lower cost launch vehicles
- Reduce launch mass
- Larger payloads

Resilient end-to-end ground network:
- Higher performance, greater capacity, secure networks



HTS- 50-200 Gbps to 1 TBps

- Innovation in ALL Satellite Bands
- Increased use of NGSO
  New Constellations (1k+ satellites)
- Open Architecture (all IP & 5G)
- Software-defined satellites
- Higher Speeds
- Increased focus on M2M, IoT,
- Enhanced Utility for rural/remote
- Ubiquitous Connectivity Land/Sea/Air

Fixed Satellite Services (WP 4A)

- **1.1: Q/V Band ESIM for GSO & NGSO**
  To consider the technical and operational conditions for the use of parts of Q/V band for aeronautical or maritime Earth Stations in Motion (A-ESIMs and M-ESIMs), in particular 47.2 - 50.2 GHz and 50.4 - 51.4 GHz.

- **1.2: Small Antennas in 13.75 - 14 GHz**
  To consider possible revisions of sharing conditions in the frequency band 13.75-14 GHz to allow the use of uplink fixed-satellite service earth stations with smaller antenna sizes.

- **1.3: Q/V Band Gateways for NGSO**
  To consider possible use of 51.4 - 52.4 GHz by gateway earth stations transmitting to non-GSO systems in the FSS.

- **1.4: Ka-Band FSS and BSS Allocation in 17.3-17.7/17.8 GHz (R3)**
  to consider a new primary allocation in Region 3 to the fixed-satellite service (FSS) in the space-to-Earth direction in the frequency band 17.3 - 17.7 GHz and to the broadcasting-satellite service (BSS) in the space-to-Earth direction in the frequency band 17.3 - 17.8 GHz

- **1.5: non-GSO FSS/MSS earth stations: unauthorized operations & service area exclusion**
  to consider regulatory measures and their implementability to limit the unauthorized operations of non-GSO ES in the FSS and MSS and associated issues related to the service area of non-GSO satellite systems in the FSS and MSS.

- **1.6: Equitable Access in Q/V Bands**
  to consider technical and regulatory measures for FSS networks/systems in the 37.5 - 42.5 GHz (space-to-Earth), 42.5-43.5 GHz, 47.2-50.2 GHz and 50.4 0 51.4 GHz (Earth-to-space) for equitable access to these frequency bands

- **7: Satellite Regulatory procedures**
  to consider of possible changes, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks.

Mobile Satellite Services (WP 4C)

- 1.11: MSS space-to-space links

  to consider the technical and operational issues and regulatory provisions for space-to-space links among GSO and non-GSO satellites in frequency bands 1 518 - 1 544 MHz, 1 545 - 1 559 MHz, 1 610 - 1 645.5 MHz, 1 646.5 - 1 660 MHz, 1 670 - 1 675 MHz and 2 483.5 - 2 500 MHz allocated to the MSS

- 1.12: NGSO MSS Allocation for low data rate

  to consider possible allocations to the MSS and possible regulatory actions in the frequency bands 1 427 - 1 432 MHz (space-to-Earth), 1 645.5 - 1 646.5 MHz (space-to-Earth)(Earth-to-space), 1 880 - 1 920 MHz (space-to-Earth)(Earth-to-space) and 2 010 - 2 025 MHz (space-to-Earth)(Earth-to-space) required for future development of low-date-rate non-GSO MSS.

- 1.13: MSS IMT Allocation for Direct to Device

  to consider studies of a possible new allocation in the frequency range 694/698 MHz to 2.7 GHz to the MSS for direct connectivity between space stations and IMT user equipment to complement terrestrial IMT network coverage.

- 1.14: Additional MSS Allocation in 2 GHz

  to consider possible additional allocations to the MSS in the frequency bands 2 010 - 2 025 MHz (Earth-to-space) and 2 160 - 2 170 MHz (space-to-Earth) in Regions 1 and 3 and 2 120 - 2 160 MHz (space-to-Earth) in all regions

Terrestrial and Science Services

Terrestrial Services (SG 5)

- 1.7: IMT usage of 4400-4800 MHz, 7125-8400 MHz & 14.8-15.35 GHz

  to consider studies on sharing and compatibility and develop technical conditions for use of IMT in the frequency bands 4.4 - 4.8 GHz, 7.125 - 8.4 GHz (or parts of) and 14.8 - 15.35 GHz

- 1.10: Power limits on FSS, MSS & BSS to protect Fixed & Mobile in 70 & 80 GHz bands

  to consider developing PFD and EIRP limits for inclusion in Article 21 for the FSS, MSS and BSS to protect fixed and mobile services in the frequency bands 71 - 76 GHz and 81 - 86 GHz

Science Services (SG 7)

- 1.16: Radio Quiet Zones

  Studies of technical and regulatory provisions necessary to protect radio astronomy operating in specific Radio Quiet Zones (RQZs) and, in frequency bands allocated to the radio astronomy service on a primary basis globally, from aggregate radio-frequency interference caused by systems in the non-geostationary-satellite orbit

- 1.18: EESS (passive) above 76 GHz

  This agenda item is to consider, based on the results of ITU Radiocommunication Sector studies, possible regulatory measures regarding the protection of the Earth exploration-satellite service (passive) and the radio astronomy service in certain frequency bands above 76 GHz from unwanted emissions of active services

- 1.19: EESS passive in 4.2-4.4 GHz

  This agenda item is to consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz

GSOA Preliminary Positions on Some WRC-27 Agenda Items

Agenda Item 1.1
Use of the FSS Q/V band (E-s) for A-ESIMs and M-ESIMs with GSO and NGSO networks

*Studies on the use of the frequency band 47.2-50.2 GHz band (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), or parts thereof, by aeronautical and maritime earth stations in motion in the fixed-satellite service, in accordance with Resolution **176 (Rev WRC-23)**;*

Background

- FSS has allocation in the considered Q/V frequency bands in article 5 of the Radio Regulation
- Increasing need for mobile communications that could be partially met with communication between A-ESIMs and M-ESIMs and FSS GSO and non-GSO networks.
- The use of these Q/V bands by ESIMs communicating with GSO or non-GSO FSS space stations would provide more spectrum and throughput for on-board users, responding to the growing demand for broadband satellite services in the air and over the seas.

GSOA position

- Supports studies aiming to develop a framework, including the technical conditions and regulatory provisions, for the use of the frequency bands 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by A-ESIMs and M-ESIMs communicating with GSO and non-GSO networks, taking into account the protection of incumbent primary services in these frequency bands and adjacent bands.
- Ensure consistency of ITU-R regulatory frameworks for ESIMs across the bands and support the development of the ITU-R Recommendation for the Network Control and Monitoring Centre (NCMC) for ESIM operations that would ensure control of ESIM transmissions without jeopardizing their development.

*to consider possible revisions of sharing conditions in the frequency band 13.75-14 GHz to allow the use of uplink fixed-satellite service earth stations with smaller antenna sizes, in accordance with Resolution **129 (WRC-23**);*

Background

- In Ku band, insufficient spectrum to fulfil the current demand for Ku-band services, only 500 MHz (14.00 - 14.5 GHz) appropriate for return links.
- Footnotes **5.502** & **5.503** apply to the **13.75 - 14.00 GHz** band: Limitations on the minimum size of the earth station antenna & maximum power flux density that a terminal can transmit prevents efficient use of this band for FSS return links. Agenda Item 1.2 calls for the review of the conditions in these footnotes

GSOA position

- GSOA supports reviewing the band's usage & sharing conditions 13.75-14 GHz to enable operation of small antennas
- Use of smaller antennas in 13.75-14 GHz band would enable more efficient use of the radio frequency spectrum, alleviate congestion in the existing uplink Ku-band and balance the amount of available uplink and downlink spectrum resources for FSS in the Ku band

Agenda Item 1.3
Use of the 51.4-52.4 GHz band to enable NGSO gateways in the FSS (E-s)

*To consider studies relating to the use of the frequency band 51.4-52.4 GHz to enable use by gateway earth stations transmitting to non-geostationary-satellite orbit systems in the fixed-satellite service (Earth-to-space), in accordance with Resolution **130 (WRC-23)**;*

Background

- The need for additional FSS spectrum in the 50 GHz range for non-GSO FSS gateway uplinks was established in response to WRC-19 9.1.9 in Report ITU-R S.2461. These studies included the need for spectrum for both non-GSO systems and GSO FSS networks.
- In response to Res. 162 (WRC-15), WRC-19 allocated 51.4-52.4 GHz to the FSS (Earth-to-space) on a primary basis and adopted No. 5.555C which limited the use of the FSS allocation to geostationary satellite networks.
- The use of this band 51.4-52.4 GHz (E-s) by NGSO FSS gateways would provide more spectrum for non-GSO FSS systems, responding to the growing demand for broadband satellite services .

GSOA position

- Supports studies and the development of a regulatory framework to enable use of the frequency band 51.4-52.4 GHz by NGSO FSS gateways (Earth-to-space).
- Supports the studies of all possible sharing situations under this agenda item, including identifying appropriate mechanisms for intra-service sharing of NGSO FSS systems and for protection of GSO systems from NGSO systems in this band.

Agenda Item 1.5
Unauthorized NGSO UTs operations & Service area

Studies on development of regulatory measures, and implementability thereof, to limit the unauthorized operations of non-geostationary-satellite orbit (non-GSO) earth stations in the fixed-satellite service (FSS) and mobile-satellite service (MSS) and associated issues related to the service area of non-GSO FSS and MSS satellite systems

Background

As per the Resolution **14 (WRC-23)**, the ITU Radiocommunication Sector is invited to complete the following studies, in time for WRC-27:

1. studies on regulatory measures to limit the unauthorized operations of non-GSO FSS and MSS earth stations in the Earth-to-space direction in order to address and cease such operations, taking into account technical and operational aspects, as appropriate.
2. studies on regulatory measures, recognizing that Member States may wish to exclude their territory from the service area of the non-GSO FSS or MSS satellite systems, and the implementability of such measures, without adversely affecting the provision of service in the rest of the service area

GSOA position

GSOA respects the sovereign rights of all administrations to authorize services provided in their territories and appreciates the concerns that underlie proposals related to non-GSO user terminals operating without authorization.

Moreover, GSOA understands that the current regulations already require that an earth station must be authorized by a country before it operates on the territory under its jurisdiction. All satellite operators should adhere strictly with the Radio Regulations, in particular with Article 18, Resolution 22 (WRC-19) and Resolution 25 (WRC-03), including by implementing available geolocation capabilities and mechanisms in their satellite systems, that could be used, to the extent possible, to exclude the transmission of a terminal from a jurisdiction in which it is not authorized.

Generally, GSOA has concerns about any proposal that would impose additional regulatory burdens on operators and regulators if they are not needed, as these could have the consequence of increasing complexity of regulatory procedures required to bring global connectivity and bridge the digital divide. In particular, any requirement for the territory of a country to be excluded from the service area of the satellite system could have unintended consequences. GSOA welcomes the opportunity to work with administrations to address all relevant concerns.

Background

The standing Agenda Item 7 invites to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution 86 (Rev.WRC07) to facilitate rational, efficient, and economical use of radio frequencies and any associated orbits, including the geostationary satellite orbit.

GSOA position

- GSOA favours a stable and predictable regulatory framework for efficient use of spectrum and orbit resources
- GSOA supports retaining the current process of continuing evolution at successive WRCs of the regime governing space services, so supports the standing Agenda item 7 for each WRC
- GSOA favours the review of RR provision bringing accurate solutions to specific detected inconsistencies with emphasis on solving the most urgent issues, i.e. well characterized issues whose improvement is urgent and impacting

Agenda Item 1.12 - possible allocations to MSS and regulatory actions required for the future development of low-data-rate non-geostationary MSS systems

to consider possible allocations to the MSS and possible regulatory actions in the frequency bands 1 427 - 1 432 MHz (space-to-Earth), 1 645.5 - 1 646.5 MHz (space-to-Earth)(Earth-to-space), 1 880 - 1 920 MHz (space-to-Earth)(Earth-to-space) and 2 010 - 2 025 MHz (space-to-Earth)(Earth-to-space) required for future development of low-date-rate non-GSO MSS

Background

- Agenda Item 1.18 (WRC-23) tried to address potential new allocation of MSS spectrum to narrow band systems. However, the ambiguity of Resolution 248 (WRC-19) and the lack of agreed technical & operational characteristics of narrowband MSS led to incomplete sharing and compatibility studies thereby resulting in a no-change. With the new resolution Res. 252 (WRC-23), there is an opportunity to conduct studies on potential new allocation to the MSS for the development of non-GSO low data rate systems.

GSOA position

- GSOA supports studies aiming at defining the spectrum requirements, technical and operational characteristics and conditions for non-GSO low-data-rate MSS systems.
- GSOA also supports studies on sharing and compatibility between the non-GSO low-data-rate MSS systems and existing primary services in-band and in the relevant adjacent frequency bands.
- The 1 645.5-1 646.5 MHz frequency band is reserved for distress, safety, and urgency communications within the GMDSS and requires further input from the International Maritime Organization before being considered under this agenda item.

Agenda Item 1.14
Studies on possible new frequency allocations to the Mobile-Satellite Service (MSS)

*Studies on possible new frequency allocations to the mobile-satellite service in the frequency bands 2 010-2 025 MHz (Earth-to-space) and 2 160-2 170 MHz (space-to-Earth) in Regions 1 and 3 and 2 120-2 160 MHz (space-to-Earth) in all Regions, in accordance with Resolution **254 (WRC-23)**;*

Background

- The tremendous growth in mobile communications has led to growth in MSS which complements MS to satisfy connectivity everywhere. Since the last MSS allocations, the range of applications and use-cases using MSS, including Direct-to-Device (D2D) and Internet of Things (IoT), has expanded significantly, as has the spectrum demand for suitable MSS allocations.
- New MSS allocations in the frequency bands 2 010-2 025 MHz (Earth-to-space) and 2 160-2 170 MHz (space-to-Earth) in Regions 1 and 3 and 2 120-2 160 MHz (space-to-Earth) in all Regions will harmonize spectrum allocations and help to address MSS spectrum demands.

GSOA position

- Supports studies under Resolves 1, 2, and 3 of Resolution **254 (WRC-23**) and new spectrum allocations to the MSS.

to consider studies on sharing and compatibility and develop technical conditions for the use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands, in accordance with Resolution ***256 (WRC-23);***

Background

- Resolution 256 (WRC-23) invites the WRC-27 to consider the identification of frequency band(s) for the terrestrial component of IMT as follows:
  - 4 400-4 800 MHz, or parts thereof, in Region 1 and Region 3;
  - 7 125-8 400 MHz, or parts thereof, in Region 2 and Region 3;
  - 7 125-7 250 MHz and 7 750-8 400 MHz, or parts thereof, in Region 1;
  - 14.8-15.35 GHz,
- The frequency band 4 500 – 4 800 MHz is a planned band allocated to FSS (space-to-Earth) service under Appendix 30B
- The frequency bands 7 250 - 7750 MHz and 7 900- 8400 MHz are allocated to the FSS and partly MSS services. These bands are mainly used for governmental and military applications
- The frequency ranges 7 125-8 400 MHz and 14.8-15.35 GHz are also used by scientific satellite services

GSOA position: Considering that many countries rely heavily on C-band FSS and X-band FSS / MSS satellite services for critical applications, which in many cases cannot be reliably provided or provided at all by other means, and that past studies between satellite services and IMT have demonstrated that sharing between FSS / MSS and IMT is not feasible. The entry of IMT into such FSS bands leads to substantial additional regulatory or technical constraints being imposed on those satellite services, which detrimentally harms the future viability and sustainability of use by FSS services in these bands and jeopardises major commercial and government investments made / being made in such satellite systems, **GSOA supports No Change in these bands 4500-4800 MHz, and 7125-8400 MHz. Furthermore, there should be no impact from any IMT identification in the bands adjacent to FSS**.

*To conduct compatibility studies between NGSO and RAS for some primary RAS allocations, as well as studies on Radio Quiet Zones (RQZ) at two RAS sites, in accordance with Resolution **681 (WRC-23)**;*

Background

- Resolves 1 and 2 call for compatibility studies between NGSO and RAS for frequency band pairs listed in table 1 to Resolution **681 (WRC-23)**, with respect to primary RAS allocations in 10.6-10.7 GHz, 42.5-43.5 GHz and others in the range from 76 GHz to 134 GHz.
- Resolves 3 to 6 calls for studies on RQZ at two specific radioastronomy sites (SKAO in South Africa, ALMA in Chile).

GSOA position

- GSOA supports studies to ensure the protection of Radioastronomy in frequency bands listed in table 1 to Resolution **681 (WRC-23)**, while not adversely affecting the NGSO operations.

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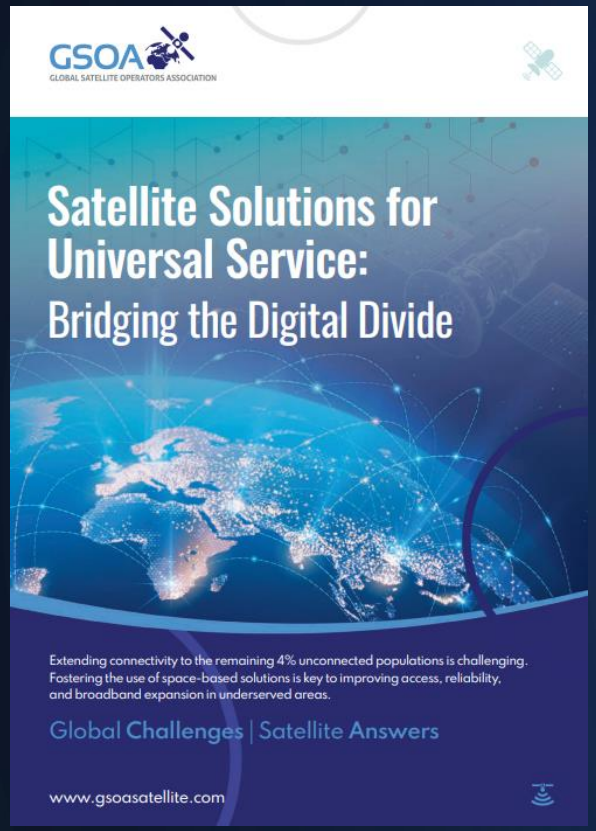
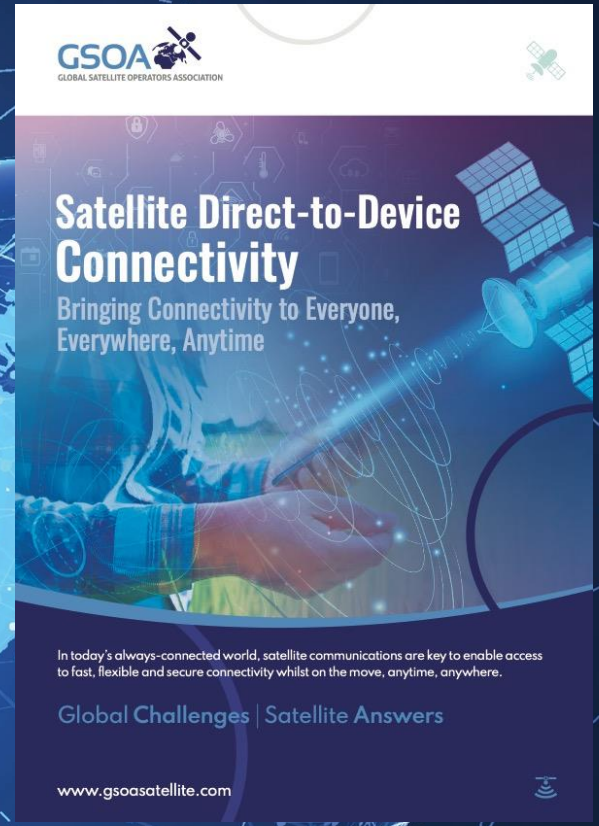
THANK YOU!





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